

PITCH CANKER INCIDENCE SURVEY IN SUSCEPTIBLE
SLASH PINE PLANTATIONS ON THE APALACHICOLA
NATIONAL FOREST, FLORIDA, 1984

Steven W. Oak

ABSTRACT

Pitch canker disease is widespread in susceptible slash pine plantations on the Apalachicola National Forest, Florida. All 56 surveyed stands had some infection, and incidence of infected trees was more than 5 percent in 26 stands. The Wakulla Ranger District had higher overall incidence and fewer lightly infected stands than the Apalachicola District. However, the Apalachicola District had a higher incidence of severely damaged trees in infected stands.

Comparisons with earlier surveys show only a slight increase in overall disease incidence in damaged stands. However, there was a striking increase in the percentage of susceptible stands that were damaged on the Wakulla District (from 18 percent in 1982 to 58 percent in 1984). This is the first instance since surveys were initiated in 1976 that the disease was more frequent there, relative to the Apalachicola District. More frequent reconnaissance of susceptible plantations, followed by salvage harvest or sanitation thinning, is suggested where losses are anticipated.

INTRODUCTION

Pitch canker disease, caused by the fungus *Fusarium moniliforme* Sheld. var. *subglutinans* Wr. & Reink., damages trees of all the important southern pine species in forest stands, seed orchards, ornamental settings, and forest tree nurseries. Currently, slash pine (*Pinus elliottii* Engelm. var. *elliottii*) is the only species damaged at economic levels in forest stands over a large geographic area. Incidence and damage are severe only in plantations that usually are below economic rotation age for pulpwood. Epidemics have periodically damaged slash pine plantations in parts of Florida since the 1940's. The most recent and severe occurred from 1976-79 and resulted in salvage harvesting of several thousand acres in the state. The disease can be found in forest stands throughout the South, but has only infrequently caused economic losses in plantations of other species (e.g., scattered loblolly pine plantations in southern Georgia and eastern North Carolina).

In slash pine, fungus infection most often occurs on the current year's growth of the terminal and upper laterals. Pitch soaked cankers result, which girdle susceptible branches. Recently killed shoots are reddish-brown, with needles adhering. Needles turn gray with age, making it possible to distinguish current year shoot mortality from previous years.

Acknowledgement is made of the efforts of J. L. Knighten and T. R. Gentry, Biological Technicians, in field data collection for the survey.

Spores produced on diseased branches are dispersed in the air most abundantly in summer, but are present at all times of the year. The deodar weevil (*Pissodes nemorensis* Germ.) can vector the fungus (introduce it into a healthy host with disease resulting), but its importance is unknown. Growth loss from the ~~elimination~~ of photosynthetic area is the major damage impact, but stem deformity due to repeated terminal mortality could account for large dollar losses from product devaluation (rendering sawtimber stands to pulpwood management objectives). Trees killed by massive crown infection rarely account for more than 2 percent of all trees in pitch cankered stands with high incidence.

The Apalachicola National Forest was surveyed by Forest Pest Management to determine the current status of the disease on the Forest. The results are also interpreted in the light of those obtained from previous surveys (1,3,5) done in alternating years beginning in 1978 to monitor changes in disease incidence, distribution, and damage over time.

METHODS

The survey was conducted during early March 1984, before pines initiated growth. The same survey stands used in the previous survey (5) were again employed, with some modifications. Previously surveyed stands that were considered not susceptible to damage based on past surveys (natural stands; plantations less than 5 or greater than 25 years old) were dropped from this survey and replaced with randomly selected susceptible plantations nearby. About half of the 1984 survey stands were replacements of previously surveyed, non-susceptible stands. Stands were bordered by Forest System roads on an approximate 3-mile by 5-mile grid covering the entire Forest and covered at least 5 acres. When survey stands were located, the following procedure was used. If no disease was observed when walking the road boundary, only stand age was recorded. If disease was observed at low levels, two observers entered the stand, each choosing a row at random. Each tallied 50 trees for presence or absence of pitch canker. If the 100-tree tally indicated disease incidence at less than 5 percent, stand age and trace incidence was recorded. For stands with equal or greater than 5 percent incidence (Incidence Above Trace Levels [IATL] stands), the Yandle-Roth ratio estimation survey method (6) was employed, and the following data were recorded for the first 75 trees in each of 3 randomly selected rows.

For each transect:

1. Stand number
2. Stand age (taken from stand records or by increment cores from 3 trees)

For each tree:

1. Infection (separate codes for current and previous years' symptoms)
 - a. Healthy
 - b. Terminal infection only
 - c. Lateral infection only
 - d. Terminal and lateral infection

2. Crown involvement (% crown killed)

- | | |
|----------------|------------------------|
| a. Trace | e. Dead - pitch canker |
| b. Trace - 25% | f. Dead - other |
| c. 26-50% | |
| d. > 50% | |

The locations of survey stands were carefully plotted on forest maps. The total number of survey stands was 56.

RESULTS AND DISCUSSION

The results of the survey of pitch canker disease on the Apalachicola National Forest in March 1984 are shown in Table 1. All 56 stands had infected trees, but the incidence of infected trees varied considerably (from trace amounts [< 5 percent] to 56 percent). Uninfected, susceptible stands had been found in all previous surveys (1,3,5).

IATL stands accounted for 58 percent of all surveyed stands on the Wakulla (average disease incidence = 40.3 percent), compared with only 38 percent on the Apalachicola (average disease incidence = 34.1 percent). Figure 1 shows the location of all surveyed stands and those with IATL. This is the first time since pitch canker surveys were initiated on the Forest that disease was more frequent and at higher incidence on the Wakulla Ranger District than on the Apalachicola District.

Though the frequency of IATL stands and their average incidence was higher for the Wakulla, there were more than twice as many trees with severe disease on the Apalachicola District. Trees with more than 25 percent of their crown killed accounted for 22 percent of all infected trees on the Apalachicola, compared with 8 percent on the Wakulla. Similarly, stem deformation, as measured by at least two consecutive years of terminal kill, was higher on the Apalachicola (14 percent of infected trees vs. 4 percent). The greater disease severity on the Apalachicola is probably due to the fact that pitch canker has been present there in more stands for a longer period of time (1,3,5). Tree mortality from pitch canker was very low on the Apalachicola District (.2 percent of infected trees) and did not occur in any surveyed stands on the Wakulla.

Results of surveys since 1978 indicate that the percentage of susceptible stands with pitch canker and the incidence of disease within infected stands have increased on the Apalachicola National Forest (Table 2). These increases were especially dramatic on the Wakulla Ranger District during the 1982 and 1983 growing seasons. The method of survey has differed only slightly in all the compared surveys, but the method of choosing survey stands differed in 1984. Nevertheless, these differences are not considered important influences on the results that have been obtained. The data summarized in Table 2 are of susceptible stands only and are, therefore, comparable.

No proven silvicultural methods are available for preventing losses in uninfected stands or for reducing losses in diseased stands. Management activities that may help have been summarized (2). Applicable considerations are:

Table 1.--Age and pitch canker disease status of susceptible slash pine plantations (age 5-25 years) surveyed on the Apalachicola National Forest, Florida, 1984.

Stand No.	Age	Infection		Crown Rating ^{1/}		e	Dead-Other	Potential ^{2/} Stem Deformity	
		Total ^{3/}	Current	a & b	c & d			83T	82T & 83T
-----percent-----									
APALACHICOLA RANGER DISTRICT									
A1	15	42	30	35	7	0	0	8	9
A2	7	T							
A3	9	T							
A4	20	31	14	24	6	1	<1	2	3
A5	12	T							
A6	23	T							
A7	15	T							
A8	14	T							
A9	15	44	21	35	10	0	<1	1	5
A10	11	T							
A11	17	T							
A12	14	32	14	26	5	0	0	1	4
A13	17	29	12	24	5	0	0	1	2
A14	10	38	27	28	10	0	0	4	8
A15	17	40	20	27	12	0	0	4	6
A16	7	T							
A17	8	T							
A18	16	16	12	15	1	0	0	4	1
A19	5	T							
A20	13	T							
A21	13	T							
A22	12	19	9	15	4	0	0	2	2
A23	14	T							
A24	5	T							
A25	11	44	25	33	10	0	0	4	9
A26	14	T							
A27	11	T							
A28	6	T							
A29	12	34	18	26	7	1	0	5	4
A30	12	T							
A31	13	40	18	28	13	0	<1	2	5
A32	15	T							
Average ^{4/}		34	18	26	8	<1	<1	3	5

Table 1.--Con't.

Stand No.	Age	Infection		Crown Rating ^{1/}		e	Dead-Other	Potential ^{2/} Stem Deformity	
		Total ^{3/}	Current	a & b	c & d			83T	82T & 83T
		-----percent-----							
WAKULLA RANGER DISTRICT									
W1	24	T							
W2	24	50	32	48	3	0	<1	0	1
W3	6	T							
W4	19	47	34	48	0	0	<1	0	0
W5	18	53	37	51	1	0	0	1	2
W6	16	30	24	30	1	0	0	<1	0
W7	5	T							
W8	17	42	17	42	0	0	0	0	0
W9	15	40	20	36	4	0	0	4	4
W10	19	57	36	48	8	0	0	<1	5
W11	11	T							
W12	17	31	12	28	3	0	<1	1	1
W13	9	T							
W14	18	47	14	43	4	0	0	1	2
W15	6	T							
W16	10	13	6	12	1	0	0	2	2
W17	16	51	28	41	10	0	<1	4	8
W18	9	T							
W19	11	16	4	16	1	0	<1	1	<1
W20	18	48	19	38	10	0	<1	2	2
W21	16	39	12	38	1	0	0	1	0
W22	5	T							
W23	12	T							
W24	10	T							
Average ^{4/}		40	24	37	3	0	<1	1	2

^{1/} Refers to percent of crown killed by pitch canker

a = trace

b = trace - 25

c = 26-50

d = >50

e = dead from pitch canker

^{2/} 83T = current terminal only lost to disease.

82T & 83T = terminal lost in each of the last 2 years.

^{3/} T = trace (pitch canker present on <5% of the trees).

^{4/} Average is calculated only from stands with incidence >5% (IATL).

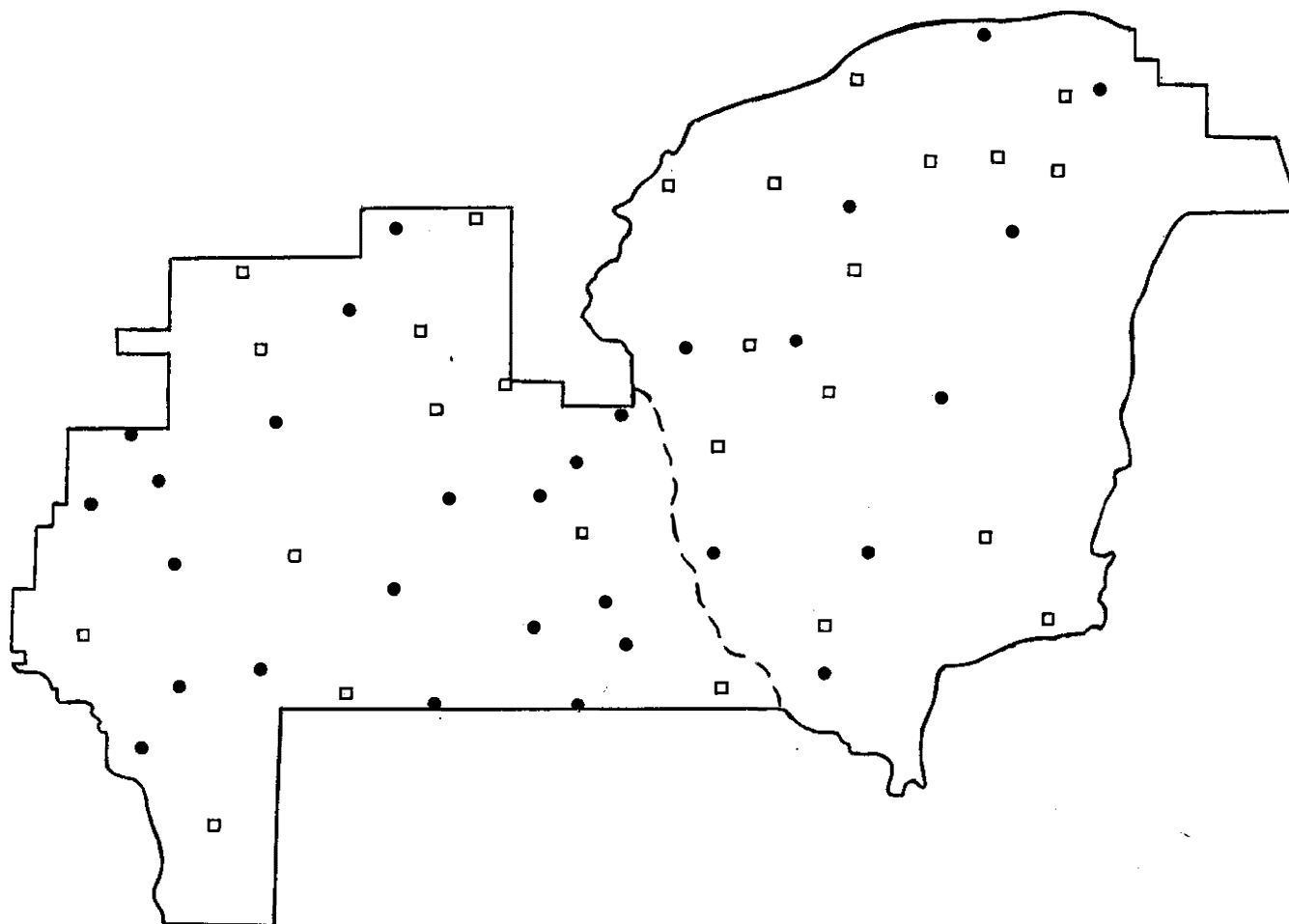


Figure 1.--Map of the Apalachicola National Forest showing the location of plantations surveyed for pitch canker disease, 1984. Stands with > 5 percent incidence are shown by □. ----- = Ranger District boundary.

Table 2.--Pitch canker disease status in susceptible* survey stands on the Apalachicola and Wakulla Ranger Districts, Apalachicola N.F., 1978 through 1984.

	Apalachicola R.D.				Wakulla R.D.			
	Year				Year			
	1984	1982	1980	1978	1984	1982	1980	1978
Percent of survey stands infected	100	93	94	77	100	88	70	38
Percent of infected survey stands with IATL <u>1/</u>	38	57	56	68	58	18	30	41
Average percent incidence for IATL stands	34	27	37	27	40	49	45	25

* Susceptible stands are plantations age 5 to 25 years.

1/ IATL = Incidence Above Trace Levels (> 5 percent of trees with pitch canker).

1. Consider natural regeneration with local seed sources (natural stands are rarely damaged by pitch canker).

2. Step up reconnaissance of susceptible plantations (age 5-25) during periods of increasing disease.

3. Where pitch canker incidence is high and individual tree damage is severe, determine if enough stems will remain to adequately stock the site if trees with deformities or other pest damage are removed. Salvage-harvest stands where adequate stocking will not result. Where adequate stocking will result, consider thinning to reduce competition stress and remove damaged trees. Attempt to conduct thinning operations between December and May, and take precautions to minimize damage to residuals. The deodar weevil, a vector of the pitch canker pathogen, breeds in dying trees from September to March in Florida (4), and greater numbers of this insect may result in more disease in subsequent years. On sites with deep, well-drained sand (18" or more), treat stump surfaces with Borax to avoid potential root disease losses. Typical flatwood sites (spodosols) apparently do not require treatment.

LITERATURE CITED

1. Anderson, R. L., T. R. Gentry, and K. Johnson. 1979. Distribution, incidence, and damage caused by the pitch canker fungus on slash and longleaf pine, Apalachicola National Forest, Florida, 1978. USDA For. Serv., SA, S&PF. Rep. #79-1-1.
2. Blakeslee, G. M., L. D. Dwinell, and R. L. Anderson. 1980. Pitch canker of southern pines: identification and management considerations. USDA For. Serv., SA, S&PF. SA-FR 11.
3. Fisher, V. J. and R. L. Anderson. 1980. Distribution, incidence, and damage caused by the pitch canker fungus on slash pine, Apalachicola National Forest, Florida, 1980. USDA For. Serv., SA, S&PF. Rep. #80-1-20.
4. Fontaine, M. S., J. L. Foltz, and J. L. Nation. 1983. Reproductive anatomy of the deodar weevil, *Pissodes nemorensis* (Coleoptera: Curculionidae), in north Florida. *Environ. Entomol.* 12:687-691.
5. Oak, S. W. 1982. Distribution, incidence, and damage caused by pitch canker disease in slash pine plantations on the Apalachicola National Forest, Florida, 1982. Trends in disease development, 1977 through 1981. USDA, For. Serv., SA, S&PF. Rep. #82-1-37.
6. Yandle, D. O. and E. R. Roth. 1971. Ratio estimation of fusiform rust incidence in southern pine plantations. *For. Sci.* 17:35-42.

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Prepared by:

Arthur W. Cole
Plant Pathologist

Approved by:

Harold W. Floyd
for Harvey V. Toko
Staff Director
Forest Pest Management